

Foreign Exchange Reserves: Bangladesh Perspective

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Abstract

This study is about foreign exchange reserves of Bangladesh. The main purpose of this study is to the influence of exchange rates on foreign exchange reserves to the Bangladesh context. Both the primary and secondary data has been used in this study. The primary data has been collected through a structured questionnaire from 50 respondents. The secondary data, namely Bangladesh foreign exchange reserves (FER), Bangladesh current account balance (CAB), Bangladesh capital and financial account balance (CFAB), and BDT/USD exchange rates (ER). This study covers yearly data from July 01, 1996 to June 30, 2005 and quarterly data from July 01, 2005 to June 30, 2012. Findings of this study shows that out of the selected 16 factors affecting foreign exchange reserves, exchange rates occupy the first position, weighted average score (WAS) being 4.56. Foreign exchange reserves (FER) and current account balance (CAB) have increased by 502.9087% and 1451.218%, whereas capital and financial account (CFAB) has decreased by -649.024% on June 30, 2012 compared to June 30, 1997. The influence of other factors held constant, as ER changes by 285.6894 units due to one unit change in FER, on average in the same direction which represents that ER has positive effect on the FER and this relationship is statistically significant. 62.1526 percent of the variation in FER is explained by ER. The outcomes of Breusch-Godfrey test (LM test), ARCH test, and the Normality test are that there is a serial correlation among residuals, the variance of residuals is not constant, and the residuals are not normally distributed.

Keywords: Foreign exchange reserves; exchange rates; regression; ARCH; LM.

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1. Introduction

Foreign exchange reserves are vital financial resources for an economic unit. In each economic region, the volume of foreign currency reserves held by the monetary authority, Central Bank, varies due to the change in monetary policy and objectives in a given economic zone. International Monetary Fund (IMF) defines foreign exchange reserves, international reserves, are external assets which are readily available to and controlled by monetary authorities for direct financing of payments imbalances through intervention of foreign exchange market. Usually, monetary authority holds convertible foreign exchanges in the form of currency, deposits, securities or financial derivatives,

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monetary gold, special drawing rights (SDRs), and unconditional drawing rights with the IMF. The countries which are involved with a huge volume of international dealings, observe a high risk of random shock to their external balances for the reason of temporary or continuous unexpected falls of their foreign exchange earnings. So, foreign exchange reserves play an important role to absorb this undesired crisis through financing in payment deficits. Moreover, foreign exchange reserves may be utilized to serve external debt or as collateral for international borrowing (Liu, 2007). Monetary authority of a country holds international reserves to directly finance international payments imbalances, to intervene in financial markets to make available liquidity in times of crises, and to influence the exchange rates. Foreign reserves which are usually held in the form of short-term, highly liquid, and interest bearing securities may used to make payment for ordinary government purchases from rest of the world or to repay loan denominated in foreign currency (Neely, 2000). Foreign exchange reserves increase in a country in the form of investments, payments received for exports, foreign loans and aids, inward foreign remittance, factor incomes, and so on, whereas it decreases payment for imports, debt service, repayment of loans, outward foreign remittance, and repatriation of investments and profits (Manu, 2009). In floating exchange rates system, like Bangladesh, international reserves are held either to incline against exchange rate over- or undershooting and /or to interfere in periods of market dysfunction or turmoil. Under both systems, reserves may be treated to an insurance policy. There is an opportunity cost to hold and manage foreign exchange reserves, insurance premium, but there are potentially huge payoffs in the form of upgraded macroeconomic outcomes and financial stability (Vallence, 2012). Economic policy makers in rising market economies have naturally viewed foreign exchange reserves as money in the bank- the higher, the better. From 1973, a transform to flexible exchange rates regimes and a capability to borrow in home currency made easy on developed countries to accumulate reserves. In the meantime, developing countries, like Bangladesh, continued to struggle with maintaining sufficient reserve volumes. Only in recent time has a remarkable scale or foreign currency reserves accumulation in rising markets elevated questions regarding its inevitability and even its wisdom (Green and Torgerson, 2007). Majority of the experimental researches on international reserve holdings constantly end that there are variables proven to be important while determining reserve holdings. The two mainly vital variables are measure of economic openness and the volatility of foreign exchange rates (Romero, 2005). International reserve is held to guarantee the international balance of payments, make stable the home currency exchange rates and increase the confidence of investors. However, it is also a misuse of resources foreign country so increasing the level of holdings in its foreign exchange reserves. This practice indicates that a country gives up utilizing foreign resources for increasing local investment and to uphold opportunities for home economic growth. On the contrary, if its foreign exchange reserves are also small, that country will have complexity intervening in foreign exchange markets and equalizing the balance of payments, so reducing on its capability to deal with the influence of international capital and financial risk. Therefore, research on optimal international reserves is vital for continued development (Zeng, 2012). The main purpose of this study is to the influence of exchange rates on foreign exchange reserves to the Bangladesh context.

2. Literature Review

Islam (2009) stated that there has been an increasing interest in Bangladesh on the alternative uses of its foreign exchange reserves. Though, various international reserves sufficiency measures on the basis of global best practices validate that its reserves holding is not noticeably more than what is needed. The country's foreign reserves reach more compared to the sufficient level only when one consider the current account viewpoints of international reserves benchmark which is possibly appropriate for the country for the reason of its financial system is still autarkic. The dynamic in its balance of payments account also supports the reality. Foreign exchange reserves are expected to give important benefits, enabling countries to interfere in foreign exchange markets and to regulate the value of their currency. But reserve accumulations also entail certain costs (Goldberg, et al. 2013). Dash and Narayanan (2010) empirically investigates the post-1991 trade dynamics in India in the light of their influence on foreign exchange reserves by estimating import and export functions for the period of January 1994 to October 2008. The findings of their study revealed that there is a long-run statistically significant association among exports, world exports, and real effective exchange rates in the export function, and among imports, domestic demand and real effective exchange rates in the import function. These outcomes signify that the trade flows are responsive to changes in demand and real exchange rates. The results of their study recommend that a least precautionary holding of foreign exchange reserves is enviable in order to delay any unnecessary adjustments in output and foreign exchange rates. Ouyang and Rajan (2011) conducted a study on Reserve accumulation and monetary sterilization in Singapore and Taiwan. The results of their study demonstrated that high-effective capital mobility has not undermined the ability of the central bank in either economy to sterilize their respective foreign exchange intervention but may make the process increasingly difficult over time. Ugolini (2011) mentioned that there is a significant difference between the past and nowadays in risk management practices. He also stated that the structure of IMF permitted central banks to minimize financial risk, whereas poor institutional design increased operational risk: this is in stark dissimilarity with the current situation, in which operational risk has been minimized and financial risk has significantly enhanced. Until now, 19th century reserve management was apparently not conducive to major losses for central banks, whereas the opposite seems to have been the case in the 21st century. Yongzhong and Freeman (2013) mentioned that international reserve play a significant role in minimizing the risks of external debt and home currency crises, and mitigating the unfavorable shocks of an unexpected decline of capital inflow or capital flight when a financial occurs. Sufficient foreign exchange reserves can provide monetary authorities broad space to adjust macroeconomic policy and enhance investors' level of confidence in the capability of a country to meet external obligations. Dominguez et al. (2010) investigated the influence of foreign exchange reserve decumulation lead to currency appreciation by using intraday foreign exchange rate data and time-stamped reserve sales and found that while foreign exchange reserves decumulation occurred each day these sales led to significant appreciation of the Koruna. Chaudhry, et al. (2011) examine the influence of foreign exchange reserves on inflation by using ARDL Modelling Approach and found that rate of inflation decreased due to increase in foreign exchange reserves. Hüfner (2000) found that fluctuation in official reserves is not essentially related to foreign exchange intervention. Fukudan and Kon (2007) investigate the macro economic impacts of foreign

exchange reserves accumulation in developing countries. The findings of their study revealed that an increase in foreign exchange reserves influence to permanent decrease in consumption, depreciation of real exchange rates, and temporal improve in current account.

3. Data And Methodology of The Study

3.1 Data

Both the primary and secondary data has been used in this study. The primary data has been collected through a structured questionnaire from 50 respondents who are the stakeholders of foreign exchange market. In the questionnaire, closed ended options have been considered and this study 5 point likert scale has been used for collecting opinions from the respondents related to determinants of foreign exchange reserves. The secondary data, namely Bangladesh foreign exchange reserves (FER), Bangladesh current account balance (CAB), Bangladesh capital and financial account balance (CFAB), and BDT/USD exchange rates (ER). This study covers yearly data from July 01, 1996 to June 30, 2005 and quarterly data from July 01, 2005 to June 30, 2012.

3.2 Normality test of the data

Jarque-bera statistics is used to test the normality of the Bangladesh foreign exchange reserves, Bangladesh current account balance, Bangladesh capital and financial account balance, and BDT/USD exchange rates.

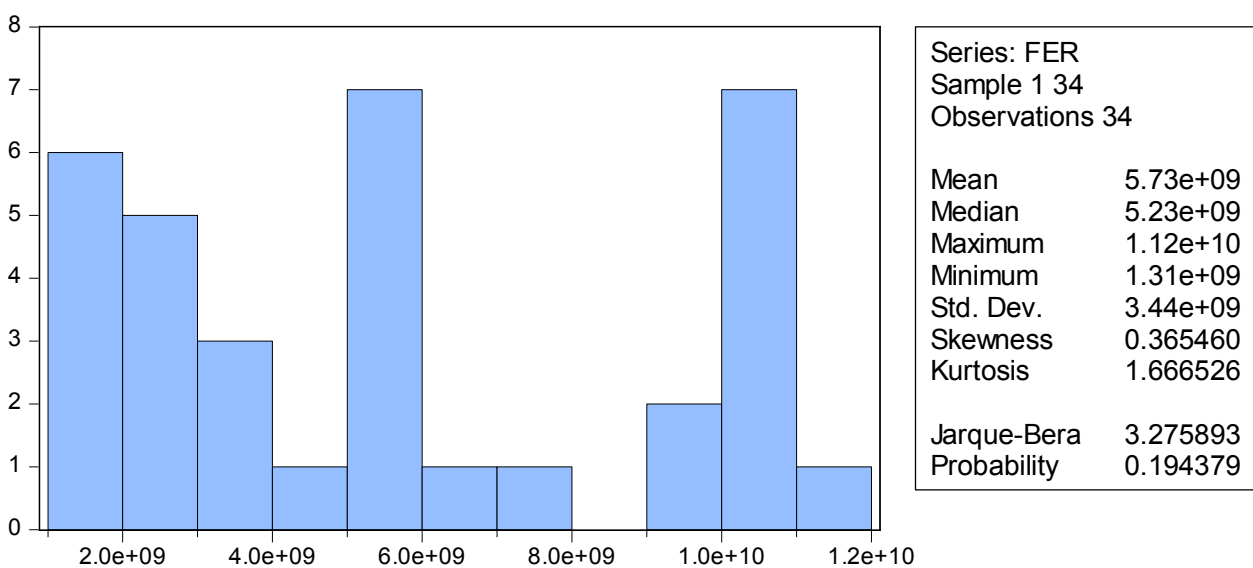


Fig. 1. Bangladesh foreign exchange reserves summary statistics

Fig. 1 demonstrates that both the skewness and kurtosis are positive. Based on the Jarque-Bera statistics, Bangladesh Foreign Exchange Reserves series is normal at 95% confidence interval, because probability is greater than 0.05. So, this series does not require any type of transformation.

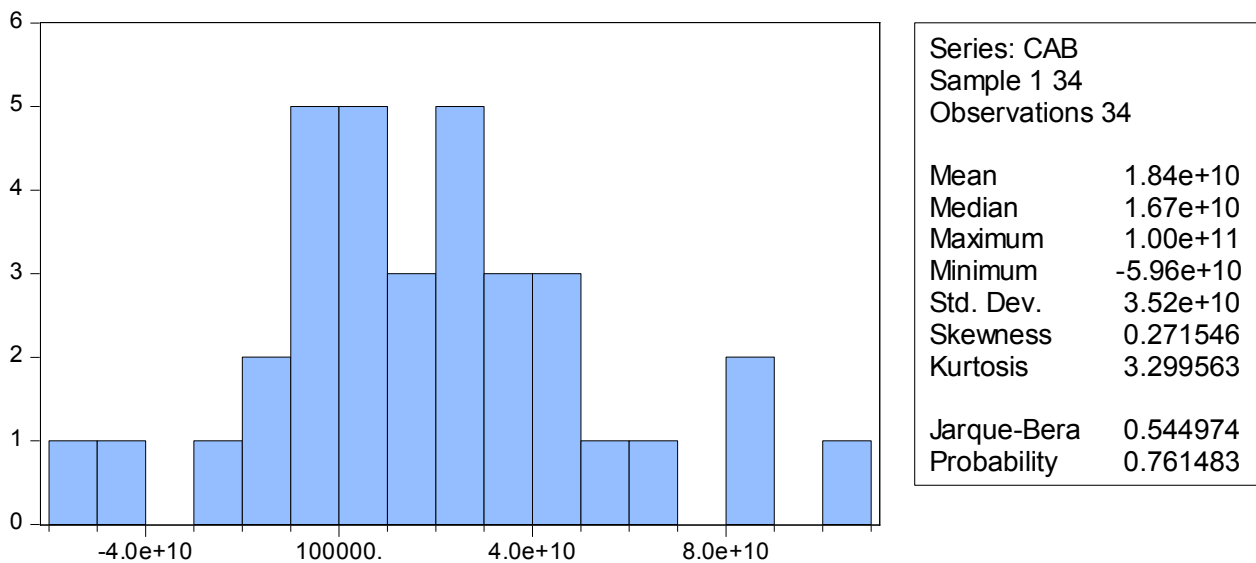


Fig. 2. Bangladesh current account balance summary statistics

Fig. 2 Illustrates that both the skewness and kurtosis are positive. Based on the Jarque-Bera statistics, Bangladesh Current Account Balance series is normal at 95% confidence interval, because probability is greater than 0.05. So, this series does not require any type of transformation.

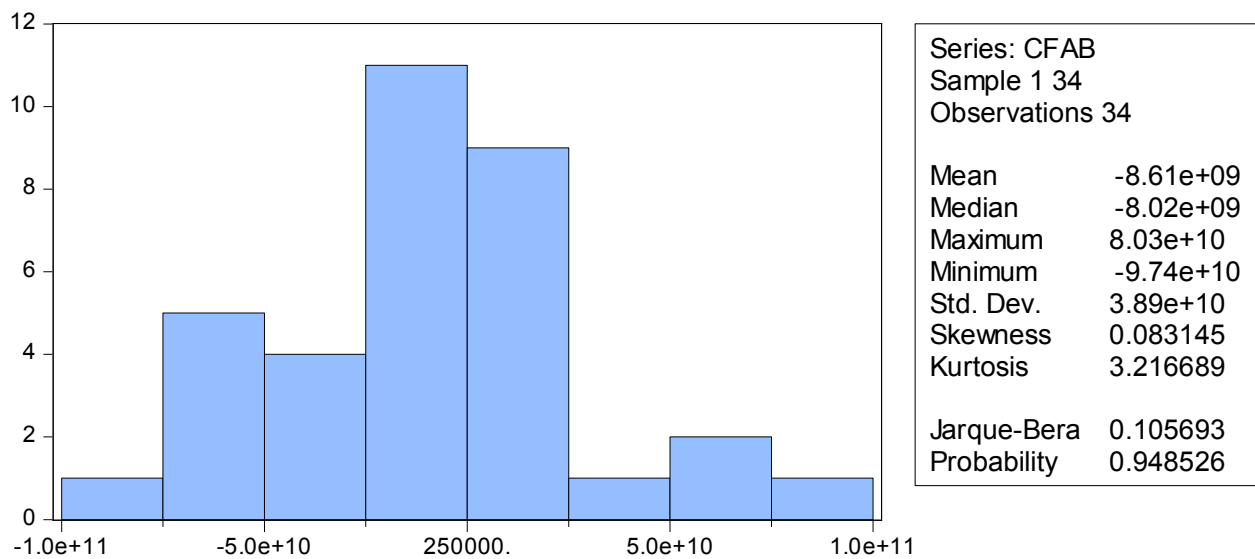


Fig. 3. Bangladesh capital and financial account balance

Fig. 3 demonstrates that both the skewness and kurtosis are positive. Based on the Jarque-Bera statistics, Bangladesh capital and financial account balance series is normal at 95% confidence interval, because probability is greater than 0.05. So, this series does not require any type of transformation.

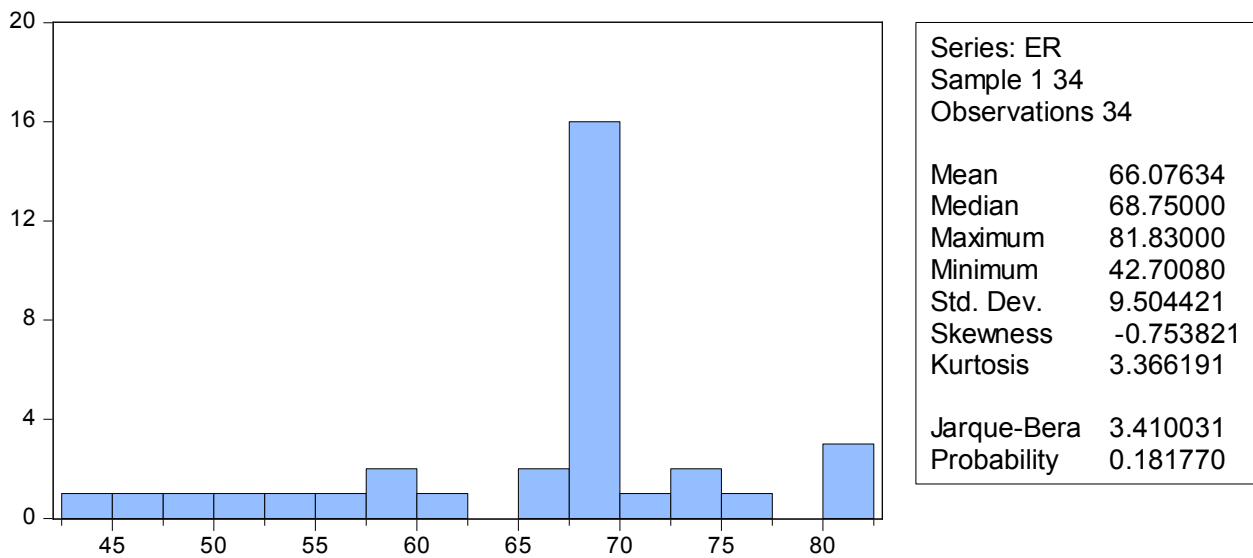


Fig. 4. BDT/USD exchange rates summary statistics

Fig. 4 shows that both the skewness and kurtosis are positive. Based on the Jarque-Bera statistics, Bangladesh capital and financial account balance series is normal at 95% confidence interval, because probability is greater than 0.05. So, this series does not require any type of transformation.

3.3 Augmented Dickey-Fuller (ADF) Test and Phillips-Perron (PP) Test

3.3.1 ADF and PP tests on FER, CAB, CFAB, and ER series are done for stationary test of data

Table1. ADF Test on FER, CAB, CFAB, and ER

| Particulars | | T-Statistic | | | | Prob.* | | | |
|-----------------------|-----------|-------------|---------|---------|---------|--------|--------|--------|--------|
| | | FER | CAB | CFAB | ER | FER | CAB | CFAB | ER |
| ADF test statistic | | -0.0940 | -3.5820 | -4.2572 | -2.2841 | 0.9416 | 0.0117 | 0.0021 | 0.1828 |
| | 1% level | -3.6616 | -3.6463 | -3.6463 | -3.6463 | | | | |
| | 5% level | -2.9604 | -2.9540 | -2.9540 | -2.9540 | | | | |
| Test critical values: | 10% level | -2.6191 | -2.6158 | -2.6158 | -2.6158 | | | | |

*mackinnon (1996) one-sided p-values.

The outputs of ADF tests on FER, CAB, CFAB, and ER are presented in table 1, and shows that the FER and ER are non-stationary, since their test statistics values are greater than the test critical values at 5% level of significance, whereas opposite situations happened in case of CAB and CFAB.

Table 2. PP Test on FER, CAB, CFAB, and ER

| Particulars | T-Statistic | | | | Prob.* | | | |
|-----------------------|-------------|---------|---------|---------|---------|--------|--------|--------|
| | FER | CAB | CFAB | ER | FER | CAB | CFAB | ER |
| PP test statistic | -0.4359 | -3.5820 | -4.2770 | -2.1879 | 0.8913 | 0.0117 | 0.0020 | 0.2142 |
| Test critical values: | 1% level | -3.6463 | -3.6463 | -3.6463 | -3.6463 | | | |
| | 5% level | -2.9540 | -2.9540 | -2.9540 | -2.9540 | | | |
| | 10% level | -2.6158 | -2.6158 | -2.6158 | -2.6158 | | | |

*mackinnon (1996) one-sided p-values

The results of the PP tests on FER, CAB, CFAB, and ER are presented in table 2 and reveals that FER, CAB, CFAB are stationary, because since their test statistics values are less than the test critical values at 5% level of significance, whereas the opposite situation is applicable for ER .

3.4 Specification of the model

In thus study, simple regression model has been applied to evaluate the influence of foreign exchange rates on foreign exchange reserves during the study period. This selected model shows the degree of relationship between independent variable (s) and dependent variable and it takes the following form:

$$FER_t = C + \beta_1 ER_t \quad [1]$$

Where,

FER_t = dependent variable (foreign exchange reserves)

ER_t = independent variable (foreign exchange rates)

C = intercept term

β_1 = change in FER due to one unit change in ER

3.5 Testing of the Results of Estimated Model

Breusch-Godfrey test (LM test), ARCH test, and the Normality test are used in this study for testing the outcomes of the estimated regression model.

4. Results and Discussion

4.1 Factors affecting foreign exchange reserves

Table 3. Responses regarding factors affecting foreign exchange reserves

| Factors | Always | Often | Sometimes | Seldom | Never | Was | Rank |
|--------------------------------------|--------|-------|-----------|--------|-------|------|------|
| Exchange rate | 35 | 10 | 10 | 5 | 0 | 4.56 | 1 |
| Opportunity cost of reserves holding | 20 | 18 | 9 | 3 | 0 | 4.1 | 7 |
| External debt | 15 | 23 | 8 | 4 | 0 | 3.98 | 10 |
| Foreign direct investment | 27 | 10 | 7 | 6 | 0 | 4.16 | 5 |
| Current account balance | 21 | 24 | 3 | 1 | 1 | 4.26 | 4 |
| Capital account balance | 29 | 14 | 5 | 2 | 0 | 4.4 | 2 |
| Capital movement | 17 | 23 | 6 | 3 | 1 | 4.04 | 9 |
| International reserve | 13 | 15 | 13 | 1 | 8 | 3.48 | 12 |
| Gdp | 10 | 15 | 8 | 12 | 5 | 3.26 | 16 |
| Interest rate | 8 | 13 | 17 | 9 | 3 | 3.28 | 15 |
| Inflation | 11 | 10 | 21 | 4 | 4 | 3.4 | 13 |
| Stock exchange operation | 9 | 16 | 16 | 3 | 6 | 3.38 | 14 |
| Political stability | 27 | 15 | 6 | 2 | 0 | 4.34 | 3 |
| Strength of the Economy | 19 | 18 | 10 | 3 | 0 | 4.06 | 8 |
| Domestic money supply | 17 | 13 | 12 | 7 | 1 | 3.76 | 11 |
| Economic openness | 23 | 15 | 8 | 4 | 0 | 4.14 | 6 |

Table 3. Depicts that out of the selected 16 factors affecting foreign exchange reserves, exchange rates occupies the first position, weighted average score (was) being 4.56. Capital account balance and political stability occupy the second and third position; was being 4.4 and 4.34 respectively. Current account balance, foreign direct investment, economic openness, opportunity cost of reserve holdings, and strength of the economy hold fourth, fifth, sixth, seventh, and eighth position; was being 4.26, 4.16, 4.14, 4.10, and 4.06 respectively. Capital movement, external debt, domestic money supply, international reserve, and inflation occupy the ninth, tenth, eleventh, twelve, and thirteen position, was being 4.04, 3.98, 3.76, 3.48, and 3.40 accordingly. Stock exchange operation, interest rate, and gdp hold the fourteenth, fifteenth, and sixteenth position; was being 3.38, 3.28, and 3.26 respectively.

4.2 Trend of CAB, CFAB, and FER

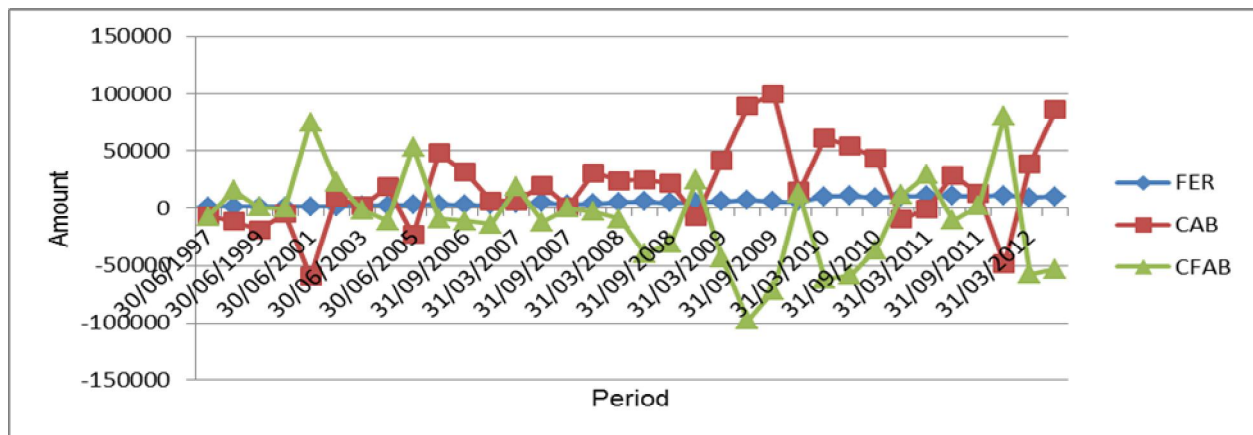


Fig. 5. Trend of CAB, CFAB, and FER

Fig. 5 demonstrates that foreign exchange reserves (fer) and current account balance (cab) have increased by 502.9087% and 1451.218%, whereas capital and financial account (cfab) has decreased by -649.024% on June 30, 2012 compared to June 30, 1997. The said figure also illustrates that fer, cab, and cfab have reached at pick position on 31/12/2011, 31/09/2009, and 31/12/2011 at \$11174000000, \$100001000000 and \$80280000000 respectively. Moreover, the outcomes of the given figure reveal that fer, cab, and cfab have held the lowest position on 30/06/2001 in bracket, and 30/06/2009 at \$1307000000, \$(59573000000), and \$(97395000000) accordingly.

4.3 Influence of the BDT/USD exchange rates on Bangladesh foreign exchange reserves

Table 4. Abbreviated estimation output from eviews7

Dependent variable: fer
Method: least squares
Date: 06/24/13 time: 12:44
Sample: 1 34
Included observations: 34

| Variable | Coefficient | Std. Error | T-statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| C | -13151.45 | 2630.090 | -5.000382 | 0.0000 |
| Er | 285.6894 | 39.41007 | 7.249146 | 0.0000 |
| R-squared | 0.621526 | mean dependent var | | 5725.853 |
| Adjusted r-squared | 0.609699 | s.d. dependent var | | 3444.213 |
| S.e. of regression | 2151.740 | akaike info criterion | | 18.24296 |
| Sum squared resid | 1.48e+08 | schwarz criterion | | 18.33275 |
| Log likelihood | -308.1304 | hannan-quinn criter. | | 18.27358 |
| F-statistic | 52.55012 | durbin-watson stat | | 0.318609 |
| Prob(f-statistic) | 0.000000 | | | |

The estimated regression model takes the following form:

$$FER_i = -13151.45 + 285.6894ER \quad [2]$$

The regression coefficient of exchange rates (er), 285.6894, indicate that with the influence of other factors held constant, as er increases (or decreases), say by one unit, on average, foreign exchange reserves (fer) increase (or decrease) by 285.6894 units. Therefore, er has positive effect on the fer which is statistically significant at 5% level of significance, since the probability of er is less than 0.05. The intercept value, -13151.45, mechanically interpreted, means that if the value of er is fixed at zero, the value of fer would be -13151.45 units, which is economically meaningless, since fer never be negative. Therefore, mathematically it can be mentioned that the fer would be -13151.45 units in absence of er, while other things remain constant. The r –squared value, 0.621526, means that 62.1526 percent of the variation in fer is explained by er a fairly high value considering that the maximum value of r-squared can at most be 1.

4.2 Testing of results of the estimated model

4.2.1 Breusch –Godfrey serial correlation lm test

Table 5. Output of Breusch-Godfrey serial correlation lm test

| | | | |
|---------------|----------|---------------------|--------|
| F-statistic | 30.63547 | prob. F(2,30) | 0.0000 |
| Obs*r-squared | 22.82448 | prob. Chi-square(2) | 0.0000 |

Table 4 shows that there is a serial correlation, i.e. The past values of the residuals can be used to predict the current values of residuals, since the probability $f(2, 30)$ is 0.0000 which is less than 0.05.

4.2.2 test of no heteroskedasticity by using autoregressive conditional heteroskedasticity (arch) test

Table 5. Output of heteroskedasticity test: arch

| | | | |
|---------------|----------|---------------------|--------|
| F-statistic | 8.618802 | prob. F(2,29) | 0.0012 |
| Obs*r-squared | 11.92976 | prob. Chi-square(2) | 0.0026 |

Table 5 demonstrates that that the residuals are heteroskedastic, i.e. The variance of residuals is not constant, since the probability $f(2, 29)$ is 0.0012 which is less than 0.05.

4.2.3 Test of normality of the distribution of the residuals

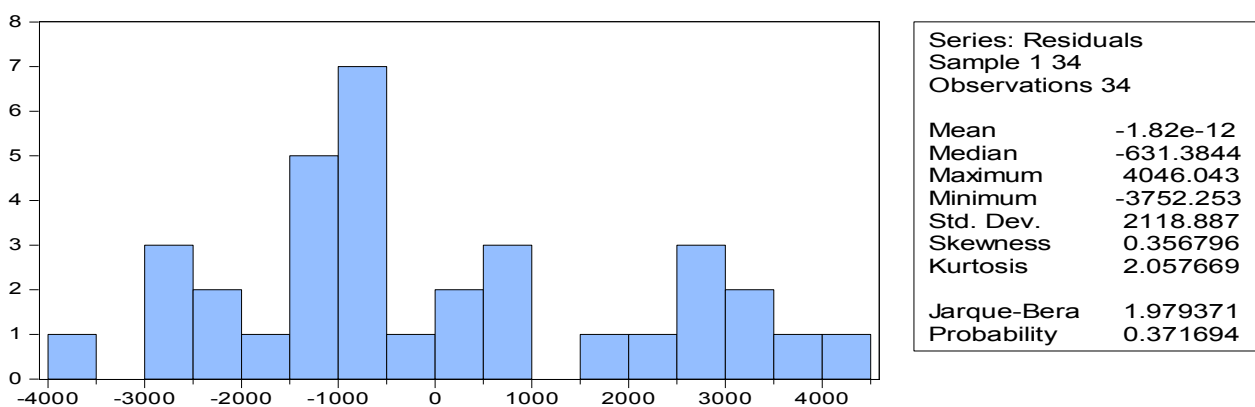


Fig. 2. Output of normality test

Figure 2 shows that the residuals are not normally distributed, since the p-value (probability) is 0.371694 which is greater than 0.05.

5. Conclusion

This paper investigates the factors affecting foreign exchange reserves by using Bangladesh foreign exchange reserves (fer), Bangladesh current account balances (cab), Bangladesh capital and financial account balances (cfab), and the BDT/USD exchange rates (er) from July 1, 1996 to June 30, 2012. Outcomes of Jarque-Bera statistics confirm that Bangladesh foreign exchange reserves, Bangladesh current account balances, Bangladesh capital and financial account balances, and the BDT/USD exchange rates series are normal. Results of ADF and PP tests on FER, CAB, CFAB, and ER series indicate that the fer and er are non-stationary, whereas opposite situations happened in case of cab and cfab. Findings of this study show that out of the selected 16 factors affecting foreign exchange reserves, exchange rates occupies the first position, weighted average score (was) being 4.56. Foreign exchange reserves (fer) and current account balance (cab) have increased by 502.9087% and 1451.218%, whereas capital and financial account (cfab) has decreased by -649.024% on June 30, 2012 compared to June 30, 1997. The said figure also illustrates that fer, cab, and cfab have reached at peak position on 31/12/2011, 31/09/2009, and 31/12/2011 at \$11174000000, \$100001000000 and \$80280000000 respectively. The influence of other factors held constant, as er changes by 285.6894 units due to one unit change in fer, on average in the same direction which represents that er has positive effect on the fer and this relationship is statistically significant. 62.1526 percent of the variation in fer is explained by er. The outcomes of Breusch-Godfrey test (LM test), ARCH test, and the normality test are that there is a serial correlation among residuals, the variance of residuals is not constant, and the residuals are not normally distributed.

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